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SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/612,552	KALKUNTE ET AL.	
	Examiner	Art Unit	
	Christine Duong	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 July 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a) because they fail to show the following items as described in the specification:

Receive message ring 112 in Fig. 1A, 1B, 1C, 1D;

Best-effort message ring 122 in Fig. 1A, 1B, 1C, 1D, 6, 7;

Shaped schedule wheel 124 in Fig. 1A, 1B, 1C, 2, 4, 6, 7; and

Link layer component(s) 222 in Fig. 5.

Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and

informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

3. The disclosure is objected to because of the following informalities:

In Page 4 of the Specification Line 2, the "shaper 112" is believed to actually be --shaper 110-- in the sentence "The shaper 112 can opportunistically service these best-effort flows using residual bandwidth left unscheduled by the schedule wheel 124".

In Page 10 and 11 of the Specification, anything pointing out to components 150, 150a, 150b, 150c, etc. should be referred to Fig. 3 rather than Fig. 4.

In Page 17 of the Specification Line 16, the "second engine 108a" is believed to actually be --second engine 108b-- in the sentence "Scheduler threads in the first engine 108a handles best-effort traffic (much like engine 108a in FIG. 6), scheduler threads in the second engine 108a handle VBR circuits; while scheduler threads in the third engine handle CBR circuits".

Appropriate correction is required.

Claim Objections

4. **Claims 1, 19** and **30** are objected to because of the following informalities:

The language of the claims is non-standard and awkward. The claims are not written to recite positive and active limitations. For example, in Claim 1, Line 3, --a receiver-- instead of "a receiver process"; in Claim 19, Line 4, --a receiver-- instead of "a

receive process"; in Claim 30, Line 7, --a receiver-- instead of "a receive process", etc. See 37 CFR 1.75 and MPEP 608.01(i)-(p). Appropriate correction is required.

5. **Claims 2-18, 20-29** and **31-34** are objected to because they depend on independent C*laims 1, 19* and *30*, which have problems as stated above. All claims should be checked by applicant for consistency and accuracy. Appropriate correction is required.

6. **Claim 10** is objected to because the second period at the end of the claim should be removed.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. **Claims 1-18** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is directed to a system; however, the body of the claim contains no structure or elements; rather, it is a series of steps. Therefore, it is unclear. In addition, the language of the claim is awkward.

Claims 2-18 are dependent from *Claim 1*; therefore, they contain the same problem explained above. For examination on the merits, the claim(s) will be interpreted as best understood.

Claim Rejections - 35 USC § 101

9. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

10. **Claims 19-29** are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Regarding **Claim 19**, the claimed computer program product is non-statutory subject matter since it is not a process, machine, manufacture nor composition of matter; see MPEP 2106(IV)(B)(1).

Claim 19 lacks the proper preamble language for statutory computer program product. See MPEP 2100 for guidance on computer related inventions.

The examiner suggest a preamble as follows:

--A computer readable medium containing computer executable instructions to perform a method, the method comprising:--

Claims 20-29 are dependent from *Claim 19*; therefore, they contain the same problem explained above.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

12. **Claims 1, 3-4, 6-9, 11, 18-19, 21, 23-25,** and **29** are rejected under 35 U.S.C. 102(e) as being anticipated by Fan et al. (US Patent 6,389,019 B1).

Regarding **Claims 1** and **19**, Fan et al. discloses a system to process packets received over a network, the system comprising:

a receive process of at least one thread of a network processor, the receive process to receive data of packets, different ones of the packets belonging to different flows ("In an ATM switch or multiplexer, cells arrive at a bottleneck point and are stored in buffers to await transmission through the bottleneck towards their destinations", Column 5, Lines 4-6 and Claim 1; where the "different flows", as claimed, are input from the at least 2 inputs of the multiplexer and the "thread", as claimed, is inherent to the sequence of computing instructions of the cells arriving, stored in buffers and await transmission); and

a transmit process of at least one thread of the network processor to transmit packets received by the receive process ("Cells are scheduled for transmission at absolute time epochs. When cells arrive, they are queued on a per-stream basis. That is, cells corresponding to stream i are buffered in a First-In First-Out (FIFO) stream queue which is denoted as Qi", Column 5, Lines 56-60 and "cells ... await transmission through the bottleneck towards their destinations", Column 5, Lines 4-6 and Claim 1; where the "thread", as claimed, is inherent to the sequence of computing instructions of the cells being transmitted);

a scheduler process of at least one thread of the network processor to populate at least one schedule of flow service based, at least in part, on quality of service characteristics associated with the different flows, the at least one schedule identifying different flow candidates for service ("The scheduler architecture and method of this

invention is based on peak rate shaping each stream to a locally computed scheduling rate. Various forms of traffic shaping can be achieved by changing the shaping algorithm", Column 6, Lines 41-44 and Claim 1; where the "quality of service characteristics", as claimed, is described as "peak rate shaping" and the "thread", as claimed, is inherent to the sequence of computing instructions of the peak rate shaping each stream to a locally computed scheduling rate); and

a shaper process of at least one thread of the network processor to select from the candidate flows for service from the at least one schedule ("In an ATM network, a traffic shaper takes an input cell stream and introduces delays to certain cells, where necessary, to produce an output cell stream which conforms to the parameters of the shaping algorithm", Column 6, Lines 30-33; where the "thread", as claimed, is inherent to the sequence of computing instructions of the delays introduced to certain cells).

Regarding **Claims 3** and **21**, Fan et al. discloses everything claimed as applied above (see *Claim 1* and *19*). In addition, the system further comprises a queue manager process of at least one thread of the network processor to queue packets based on their associated flow ("Queue manager 2 stores arriving cells in cell memory 1 in the form of stream queues, Q1, Q2, . . . QK", Column 5, Lines 11-15).

Regarding **Claim 4**, Fan et al. discloses everything claimed as applied above (see *Claim 3*). In addition, the queue manager is situated in a process-flow before the scheduler ("During each cell time, queue manager 2 may choose a cell in memory to be transmitted to the next stage in the switch. The choice of the next cell to transmit is determined by scheduler 3", Column 5, Lines 18-21 and Fig. 1).

Regarding **Claims 6** and **23**, Fan et al. discloses everything claimed as applied above (see *Claim 1* and *19*). In addition, at least one thread of the scheduler process comprises more than one thread, different ones of the threads operating on different packet engines of the network processor ("scheduling stream queues serving cells with different quality-of-service (QoS) requirements while shaping the transmission rate to avoid congestion at bottlenecks within an ATM switch", Column 1, Lines 17-21).

Regarding **Claim 7**, Fan et al. discloses everything claimed as applied above (see *Claim 1*). In addition, the at least one schedule comprises a schedule wheel having a collection of slots, an individual slot including an array of entries corresponding to different egress ports ("The structure of the timewheel can be described as a circular array of entries numbered 0, 1, . . . N-1, where the nth entry points to a (possibly empty) list of eligible stream queues scheduled for time n (modulo N)", Column 9, Lines 12-16).

Regarding **Claims 8** and **25**, Fan et al. discloses everything claimed as applied above (see *Claim 7* and *24*). In addition, the individual entries within the array of entries comprise flow service candidates assigned to different service priorities ("extracting a stream queue identifier from the ready lists in order of priority", Column 13, Lines 66-67).

Regarding **Claim 9**, Fan et al. discloses everything claimed as applied above (see *Claim 7*). In addition, the at least one scheduler thread comprises at least one thread to cache at least one of the following in memory of a packet engine in the network processor: traffic parameters of a flow and a portion of a schedule wheel occupancy vector identifying scheduling candidate vacancies in the scheduling wheel

("The bit maps are initialized to zero, indicating that all timewheel time-bins are initially empty. A value of one in a bit map entry indicates that the corresponding timewheel time-bin is not empty", Column 12, Lines 45-49).

Regarding **Claim 11**, Fan et al. discloses everything claimed as applied above (see *Claim 1*). In addition, the schedule comprises multiple schedule wheels, different wheels corresponding to different ports ("by using two timewheels as follows... a fine grain (FG) timewheel, where each entry corresponds to one cell time and a coarse grain (CG) timewheel, where each entry corresponds to a several cell times", Column 9, Lines 35-41).

Regarding **Claim 18**, Fan et al. discloses everything claimed as applied above (see *Claim 1*). In addition, the at least one of thread of the schedule process comprises a thread to schedule a flow for service in multiple slots ("several stream queues may become eligible during the same time slot", Column 10, Lines 44-48).

Regarding **Claim 24**, Fan et al. discloses everything claimed as applied above (see *Claim 19*). In addition, the schedule comprises a collection of slots, an individual slot including an array of entries corresponding to different egress ports ("The structure of the timewheel can be described as a circular array of entries numbered 0, 1, . . . N-1, where the nth entry points to a (possibly empty) list of eligible stream queues scheduled for time n (modulo N)", Column 9, Lines 12-16).

Regarding **Claim 29**, Fan et al. discloses everything claimed as applied above (see *Claim 19*). In addition, the at least one scheduler thread comprises at least one thread to cache traffic parameters of a flow in packet engine memory ("Control memory

4 stores information, corresponding to each stream queue, which is used to perform buffer management and scheduling", Column 5, Lines 35-38).

13. **Claims 1-2, 5, 16-17, 19-20,** and **22** are rejected under 35 U.S.C. 102(e) as being anticipated by Rose (US Patent 6,519,595 B1).

Regarding **Claim 1** and **19**, Rose discloses a system to process packets received over a network, the system comprising:

a receive process of at least one thread of a network processor, the receive process to receive data of packets, different ones of the packets belonging to different flows ("ATM cells are received by a cell input function 212", Column 3, Line 48 and "The VCC assignment allows flows to be multiplexed at the cell level (e.g., one cell from one flow followed by one cell from another flow)", Column 4, Lines 48-50 and Fig. 2; where the "thread", as claimed, is inherent to the sequence of computing instructions of the cells received by the cell input function and multiplexed at the cell level); and

a transmit process of at least one thread of the network processor to transmit packets received by the receive process ("the forwarding API block 230 passes data units, Flow IDs, and/or requests for assignment of Flow IDs and QoS from the flow classification and routing block 218 to a fly-by flow admission control block 232", Column 6, Lines 52-55; where the "thread", as claimed, is inherent to the sequence of computing instructions of the cells forwarded through the forwarding API block);

a scheduler process of at least one thread of the network processor to populate at least one schedule of flow service based, at least in part, on quality of service characteristics associated with the different flows, the at least one schedule identifying

different flow candidates for service ("scheduling looks at all the flows and makes a determination as to which flow to service next and transmit a data unit from the flow", Column 10, Lines 37-39 and "the quality of service ("QoS") parameters assigned to the flow", Column 4, Lines 10-11; where the "thread", as claimed, is inherent to the sequence of computing instructions of the flows scheduled to be service next); and

a shaper process of at least one thread of the network processor to select from the candidate flows for service from the at least one schedule ("Shaping is a function of limiting the maximum rate at which data units can be transmitted for any given flow", Column 10, Lines 21-22; where the "thread", as claimed, is inherent to the sequence of computing instructions of the data units transmitted for a flow).

Regarding **Claim 2** and **20**, Rose discloses everything claimed as applied above (see *Claim 1* and *19*). In addition,

the packets comprise Asynchronous Transfer Mode (ATM) cells ("The data path (e.g., ATM cells, frames, etc.)", Column 2, Line 49);

the flows comprise at least one of virtual circuits and virtual paths ("ATM connection type (VPC or VCC)", Column 6, Line 4); and

the quality of service characteristics comprise at least one of the following classes: Constant Bit Rate (CBR) and Variable Bit Rate (VBR) ("Traffic contract (e.g., ABR, UBR, VBR, CBR, GFR)", Column 6, Line 8).

Regarding **Claim 5** and **22**, Rose discloses everything claimed as applied above (see *Claim 1* and *19*). In addition, at least one of the process threads communicates a message to a thread in a subsequent one of the processes via at least one neighbor

register provided by a packet engine processing the at least one of the process threads ("The LMI, OAM, and signaling messages passed back to the supervision message system 220 from the connection management task 226 are sent directly to a buffer management block 234 for queuing in queues 236, and subsequent output", Column 5, Lines 29-33).

Regarding **Claim 16**, Rose discloses everything claimed as applied above (see *Claim 1*). In addition, the at least one shaper thread: queues flows associated with ports having flow control asserted; and dequeues the flows after flow control is deasserted ("The queues 236 are coupled to a two-tiered hierarchical shaper/scheduler block 238, having a hierarchy level-1 shaper/scheduler and a hierarchy level-2 shaper/scheduler, that selects a flow for service" Column 8, Lines 22-25 and "a dequeuing process 800 of the two-tiered hierarchy shaper/scheduler 238", Column 13, Lines 24-25).

Regarding **Claim 17**, Rose discloses everything claimed as applied above (see *Claim 16*). In addition, the shaper thread queues the flows with identification of classes of service associated with the flows and selects flows for servicing after flow control is deasserted based on the identification ("The flow classification and routing block 218 determines whether a flow has been set up for an incoming data unit, and determines the class of traffic that the flow is assigned", Column 4, Lines 3-5 and "Assignment of the Flow ID is dependent on the classification of the flow", Column 4, Lines 11-12).

14. **Claims 1, 12-13, 19, 27-28** are rejected under 35 U.S.C. 102(e) as being anticipated by Malaney et al. (PG Pub US 2002/0039349 A1).

Regarding **Claim 1** and **19**, Malaney et al. discloses a system to process packets received over a network, the system comprising:

a receive process of at least one thread of a network processor, the receive process to receive data of packets, different ones of the packets belonging to different flows ("Each incoming traffic source on corresponding lines 200-202 is regulated in a corresponding regulator 208", [0010] and Fig. 2; where the "thread", as claimed, is inherent to the sequence of computing instructions of the incoming traffic source); and

a transmit process of at least one thread of the network processor to transmit packets received by the receive process ("The multiplexer 204 outputs a regulated traffic stream on the transmission path 102 which connects across a boundary of the network 106 to the edge switch 104", [0010]; where the "thread", as claimed, is inherent to the sequence of computing instructions of the regulated traffic stream transmitted);

a scheduler process of at least one thread of the network processor to populate at least one schedule of flow service based, at least in part, on quality of service characteristics associated with the different flows, the at least one schedule identifying different flow candidates for service ("the sources thereafter being aggregated in a buffer/FIFO scheduler 209", [0010] and "Users (not shown) of terminals 100 and 118 are typically interested in achieving a predictable QoS from end-to-end ... Important QoS parameters in packet networks include packet loss, end to end packet delay and end to end packet timing jitter caused by delays and/or overflows in finite buffers in the

various network elements (eg. 104, . . . , 110) between the two users" [0009]; where the "thread", as claimed, is inherent to the sequence of computing instructions of the incoming traffic being accumulated in the scheduler); and

a shaper process of at least one thread of the network processor to select from the candidate flows for service from the at least one schedule ("The shaper can vary the delay of packets passing through it, and accordingly, the traffic output from a shaper can be constrained to meet specified criteria such as peak packet rate, sustained packet rate and/or average packet rate", [0006]; where the "thread", as claimed, is inherent to the sequence of computing instructions of the delay of packets due to specified criteria).

Regarding **Claim 12** and **27**, Malaney et al. discloses everything claimed as applied above (see *Claim 1* and *19*). In addition,

the at least one thread of the scheduler process comprises at least one thread to identify flows associated with best-effort service ("a "best effort service", is similar to a VBR connection, in that it is statistical (ie not CBR) in nature", [0028]); and

the at least one thread of the shaper process comprises at least one thread to service a best-effort flow using egress port bandwidth unscheduled by the at least one schedule ("UBR connections are typically provided when the network has excess bandwidth available, and UBR defined traffic is carried through the network with no performance guarantees", [0028]).

Regarding **Claim 13**, Malaney et al. discloses everything claimed as applied above (see *Claim 12*). In addition, the at least one thread to identify flows associated

with best-effort service comprises at least one thread to send a message to at least one shaper thread identifying a subset of a best-effort vector, individual entries in the best-effort vector corresponding to a flow ("Network infrastructure is typically provided to police network connections in such a manner that connections specified to be one of the aforementioned connection types are maintained within a corresponding envelope of performance characteristics", [0022] and "a UBR connection is not associated with any formal traffic descriptors or quality of services (QoS) quarantees. UBR connections are typically provided when the network has excess bandwidth available, and UBR defined traffic is carried through the network with no performance guarantees" [0028]).

Regarding **Claim 28**, Malaney et al. discloses everything claimed as applied above (see *Claim 27*). In addition, the at least one thread to identify flows associated with best-effort service comprises at least one thread to send a message to a shaper thread identifying a subset of a best-effort vector, individual entries in the best-effort vector corresponding to a flow associated with best-effort service ("Network infrastructure is typically provided to police network connections in such a manner that connections specified to be one of the aforementioned connection types are maintained within a corresponding envelope of performance characteristics", [0022] and "a UBR connection is not associated with any formal traffic descriptors or quality of services (QoS) quarantees. UBR connections are typically provided when the network has excess bandwidth available, and UBR defined traffic is carried through the network with no performance guarantees" [0028]).

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

17. **Claim 10** and **26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al. further in view of Malaney et al.

Regarding **Claim 10**, Fan et al. discloses everything claimed as applied above (see *Claim 7*). However, Fan et al. fails to specifically disclose that the at least one thread of the scheduler process comprises a thread to schedule service of a flow based, at least in part, on a port bandwidth vector associated with an egress port used to transmit packets, individual elements within the port bandwidth vector identifying whether a particular port has been reserved for transmission, individual elements within the port bandwidth vector corresponding to different slots within the at least one schedule wheel, as claimed.

Nevertheless, Malaney et al. teaches "the Network Management Administrator must allocate a requisite amount of available network bandwidth to each of n corresponding users. When a new user appears and requests a specific QoS for his new traffic stream, the Network Management Administrator must decide, typically in real time in a practical network situation, whether the resources are available to accommodate this new request" (Malaney et al.: [0047]).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Fan et al.'s scheduler to identify whether a transmission port has been reserved because "the input links that are to be scheduled for transmission over the output link in such a manner that the desired QoS requirements for each input link arm will be satisfied" (Malaney et al.: [0047]).

Regarding **Claim 26**, Fan et al. discloses everything claimed as applied above (see *Claim 24*). However, Fan et al. fails to specifically disclose that the at least one thread of the scheduler process comprises a thread to schedule service of a flow based, at least in part, on a port bandwidth vector associated with an egress port, individual elements within the port bandwidth vector identifying whether a particular port has been reserved for transmission at a particular slot, as claimed.

Nevertheless, Malaney et al. teaches "the Network Management Administrator must allocate a requisite amount of available network bandwidth to each of n corresponding users. When a new user appears and requests a specific QoS for his new traffic stream, the Network Management Administrator must decide, typically in real

time in a practical network situation, whether the resources are available to accommodate this new request", [0047].

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Fan et al.'s scheduler to identify whether a transmission port has been reserved because "the input links that are to be scheduled for transmission over the output link in such a manner that the desired QoS requirements for each input link arm will be satisfied" (Malaney et al.: [0047]).

18. **Claims 14-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Malaney et al. further in view of Fan et al.

Regarding **Claim 14**, Malaney et al. discloses everything claimed as applied above (see *Claim 12*). However, Malaney et al. fails to specifically disclose that the at least one shaper thread identifies a schedule wheel slot processed by the shaper; and the at least one scheduler thread schedules a flow for service based on the identified schedule wheel slot, as claimed.

Nevertheless, Fan et al. teaches "scheduling stream queues serving cells with different quality-of-service (QoS) requirements" (Fan et al.: Column 1, Lines 17-19) and "stream queues are scheduled by means of scheduling memory 5A, which assumes the form of a timewheel data structure" (Fan et al.: Column 6, Lines 10-12).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include Malaney et al.'s invention with a schedule wheel slot processed by the shaper and to schedule a flow for service based because it

allows the system to have a "flexible and scalable architecture" (Fan et al.: Column 2, Lines 30-31).

Regarding **Claim 15**, Malaney et al. discloses everything claimed as applied above (see *Claim 12*). However, Malaney et al. fails to specifically disclose that the at least one shaper thread processes each slot for the same amount of time, as claimed.

Nevertheless, Fan et al. teaches "calculating a timestamp value for each stream queue based on its scheduling rate value" (Fan et al.: Column 15, Lines 5-6).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Malaney et al.'s shaper to process each slot for the same amount of time because "timestamp value represents the next time epoch at which a stream queue is eligible to be served" (Fan et al.: Column 5, Lines 39-41).

19. **Claims 30-34** are rejected under 35 U.S.C. 103(a) as being unpatentable over Malaney et al. further in view of Rose and Fan et al..

Regarding **Claim 30**, Malaney et al. discloses a system to process Asynchronous Transfer Mode (ATM) cells received over a network, the system comprising:

multiple line cards, an individual line card including (terminal 100 and 214, Fig. 2):

at least one physical layer component (PHY) (corresponding lines 200, 202, 216, 218, Fig. 2); and

at least one network processor having multiple packet engines having access to instructions to provide (the following elements, either alone or in

combination: corresponding regulator 208, buffer/FIFO scheduler 209 and multiplexer 204):

a receive process of at least one thread of a network processor, the receive process to receive data of cells, different ones of the cells belonging to different virtual circuits ("Each incoming traffic source on corresponding lines 200-202 is regulated in a corresponding regulator 208", [0010] and Fig. 2; where the "thread", as claimed, is inherent to the sequence of computing instructions of the incoming traffic source); and

a transmit process of at least one thread of the network processor to transmit cells received by the receive process ("The multiplexer 204 outputs a regulated traffic stream on the transmission path 102 which connects across a boundary of the network 106 to the edge switch 104", [0010]; where the "thread", as claimed, is inherent to the sequence of computing instructions of the regulated traffic stream transmitted);

a scheduler process of at least one thread of the network processor to generate at least one schedule for virtual circuit service, based at least in part, on quality of service classes associated with the virtual circuits, the at least one schedule comprising a schedule wheel having a collection of slots, an individual slot including an array of entries corresponding to different ports, individual entries within the array of entries including virtual circuit service candidates assigned to different service priorities ("the sources thereafter being aggregated in a buffer/FIFO scheduler 209",

[0010] and "Users (not shown) of terminals 100 and 118 are typically interested in achieving a predictable QoS from end-to-end ... Important QoS parameters in packet networks include packet loss, end to end packet delay and end to end packet timing jitter caused by delays and/or overflows in finite buffers in the various network elements (eg. 104, . . . , 110) between the two users" [0009] and "the Network Management Administrator must allocate a requisite amount of available network bandwidth to each of n corresponding users. When a new user appears and requests a specific QoS for his new traffic stream, the Network Management Administrator must decide, typically in real time in a practical network situation, whether the resources are available to accommodate this new request", [0047]; where the "thread", as claimed, is inherent to the sequence of computing instructions of the incoming traffic being accumulated in the scheduler); and

a shaper process of at least one thread of the network processor to identify virtual circuits to service based on the schedule wheel slots ("The shaper can vary the delay of packets passing through it, and accordingly, the traffic output from a shaper can be constrained to meet specified criteria such as peak packet rate, sustained packet rate and/or average packet rate", [0006]; where the "thread", as claimed, is inherent to the sequence of computing instructions of the delay of packets due to specified criteria); and

a switch fabric interconnecting the multiple line cards ("The switch 104 can perform a switching function alone, or alternatively, can in addition perform regulation/aggregation functions", Fig. 2)

However, Malaney et al. fails to specifically disclose that the scheduler process services virtual circuit on quality of service classes associated with the virtual circuits with a schedule wheel having a collection of slots assigned to different service priorities and that the shaper process identifies virtual circuits to service based on the schedule wheel slots.

Nevertheless, Rose teaches "ATM connection type (VPC or VCC)" (Rose: Column 6, Line 4). As well, Fan et al. teaches "The structure of the timewheel can be described as a circular array of entries numbered 0, 1, . . . N-1, where the nth entry points to a (possibly empty) list of eligible stream queues scheduled for time n (modulo N)" (Fan et al.: Column 9, Lines 12-16) and "extracting a stream queue identifier from the ready lists in order of priority" (Fan et al.: Column 13, Lines 66-67).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to allow Malaney et al.'s system to service for virtual circuit because the user will be able to "lease VPC and/or VCC services from a communication carrier" (Rose: Column 3, Lines 3-4). Additionally, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to add a timewheel with array of entries corresponding to ports for scheduling because it allows the system to have a "flexible and scalable architecture" (Fan et al.: Column 2, Lines 30-31).

Regarding **Claim 31**, Malaney et al, Rose and Fan et al. discloses everything claimed as applied above (see *Claim 30*). However, Malaney et al. fails to specifically disclose that at least one of the process threads communicates a message to a thread in a subsequent one of the processes via at least one neighbor register provided by a packet engine processing the at least one of the process threads, as claimed.

Nevertheless, Rose teaches that "The LMI, OAM, and signaling messages passed back to the supervision message system 220 from the connection management task 226 are sent directly to a buffer management block 234 for queuing in queues 236, and subsequent output" (Rose: Column 5, Lines 29-33).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Malaney et al.'s system to communicate a message to a neighbor because they are "passed directly to a supervision message system block 220 for setting up/tearing down connections, etc." (Rose: Column 3, Lines 57-59).

Regarding **Claim 32**, Malaney et al, Rose and Fan et al. discloses everything claimed as applied above (see *Claim 30*). In addition, the at least one thread of the scheduler process comprises a thread to schedule service of a flow based, at least one part, on a port bandwidth vector associated with an egress port used to transmit packets for the flow, individual elements within the vector identifying whether a particular port has been reserved for transmission at a particular slot ("the Network Management Administrator must allocate a requisite amount of available network bandwidth to each of n corresponding users. When a new user appears and requests a specific QoS for

his new traffic stream, the Network Management Administrator must decide, typically in real time in a practical network situation, whether the resources are available to accommodate this new request"; Malaney et al.: [0047]).

Regarding **Claim 33**, Malaney et al, Rose and Fan et al. discloses everything claimed as applied above (see *Claim 30*). In addition, the at least one thread of the scheduler process comprises at least one thread to identify flows associated with best-effort service; and the at least one thread of the shaper process comprises at least one thread to service a best-effort flow using egress port bandwidth unscheduled by the at least one schedule ("a "best effort service", is similar to a VBR connection, in that it is statistical (ie not CBR) in nature"; Malaney et al.:[0028] and "UBR connections are typically provided when the network has excess bandwidth available, and UBR defined traffic is carried through the network with no performance guarantees"; Malaney et al.: [0028]).

Regarding **Claim 34**, Malaney et al, Rose and Fan et al. discloses everything claimed as applied above (see *Claim 33*). In addition, the at least one thread to identify flows associated with best-effort service comprises at least one thread to send a message to a shaper thread identifying a subset of a best-effort vector, individual entries in the best-effort vector corresponding to a flow associated with best-effort service ("Network infrastructure is typically provided to police network connections in such a manner that connections specified to be one of the aforementioned connection types are maintained within a corresponding envelope of performance characteristics"; Malaney et al.: [0022] and "a UBR connection is not associated with any formal traffic

descriptors or quality of services (QoS) quarantees. UBR connections are typically provided when the network has excess bandwidth available, and UBR defined traffic is carried through the network with no performance guarantees"; Malaney et al.: [0028]).

Citation of Pertinent Prior Art

20. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Burns (US 2003/0147399 A1) discloses an ATM network traffic shaper shaping transmit data on one or more virtual circuits (VCs) according to the specified quality of service (QoS) parameters.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christine Duong whose telephone number is (571) 270-1664. The examiner can normally be reached on Monday - Friday: 730 AM - 5 PM est.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eliseo Ramos-Feliciano can be reached on (571) 272-7925. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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